NAME:

For the following exercises, read the problems carefully and show all your work. Attach more pages if necessary. Please, turn in ONE pdf.

1   Limits

Solve the following limits or show they do not exist.

1. $\lim_{x \to \infty} \dfrac{e}{x}$

2. $\lim_{x \to -\infty} \dfrac{e}{x}$

3. $\lim_{x \to 3} \dfrac{x}{x^3 - 27}$

4. $\lim_{x \to \infty} \dfrac{x}{x^3 - 27}$

5. $\lim_{x \to 3} \dfrac{x-3}{x^3-27}$
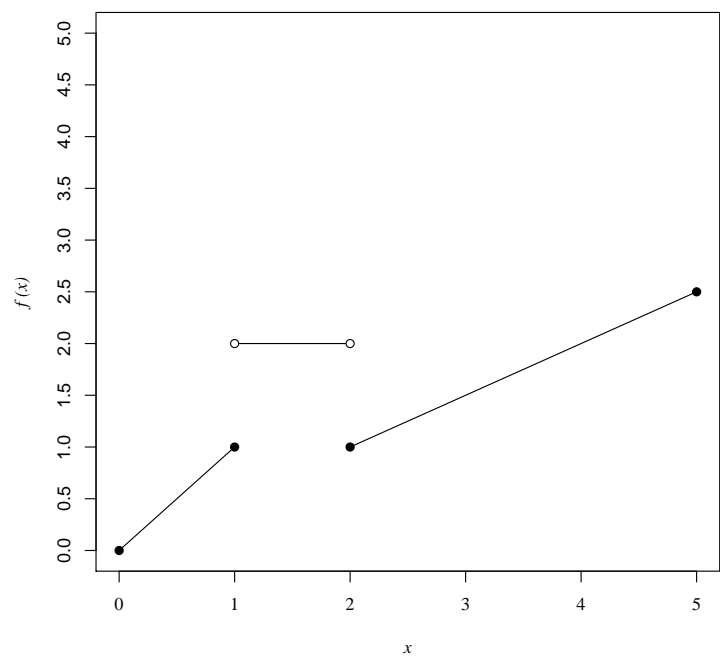
6. $\lim_{x \to \infty} \dfrac{x+1}{2x}$

7. $\lim_{x \to \infty} \left(\dfrac{1}{2}\right)^x$

8. $\lim_{x \to \infty} \dfrac{3x^3+2x^2-x+3}{4x^4+3x^3+2x^2+x+4}$

9. $\lim_{x \to 0} \dfrac{1}{x^2}$

10. The limit as x approaches (a) 1, (b) 2, and (c) 5, for the following function defined on $x \in [0, 5]$:

2 Continuity

Identify which of the following functions are continuous. For functions that are not continuous, identify the points of discontinuity.
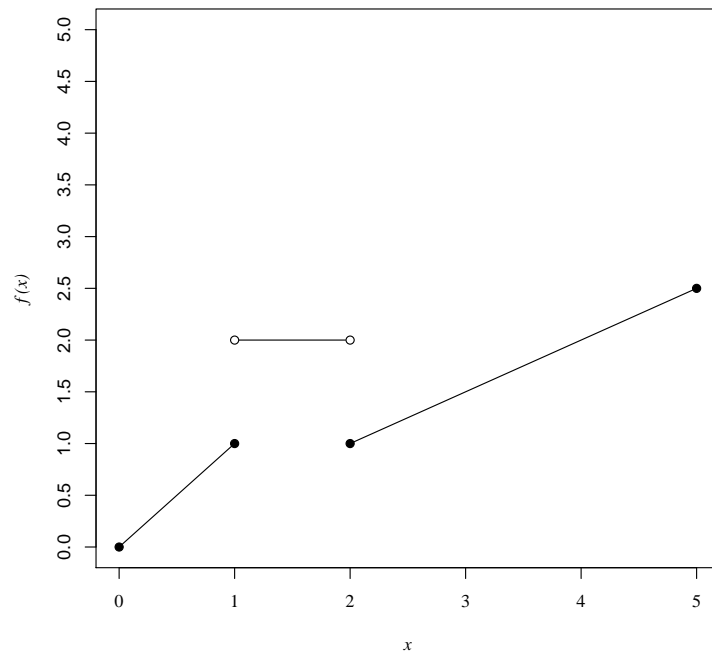
1. $f(x) = x^2$

2. $f(x) = \dfrac{1}{x}$

3. $f(x) = \dfrac{x-3}{x^3 - 27}$

4. $f(x) = \begin{cases} x^2 & \text{for } x < 1 \\ x & \text{for } x \geq 1 \end{cases}$

5. The function depicted below:

3   Sequences

For each of the following cases, state whether the sequence $\{u_n\}$ converges to a limit, and if so, find the limit:

1. $u_n = 1 + \dfrac{1}{2}n$

2. $u_n = 1 - \dfrac{1}{2}n$

3. $u_n = \left(\dfrac{1}{2}\right)^n$

4. $u_n = \left(-\dfrac{1}{2}\right)^n$

5. $u_n = ln(n)$

6. $u_n = 4 - \frac{8}{n}$

7. $u_n = 1, -1, 1, -1, 1, -1, ...$